Sketching Vector Potential

i. The equations defining **A** are <u>mathematically analogous</u> to Maxwell's equations for **B**:

$$\nabla \cdot \mathbf{B} = 0 \quad \Leftrightarrow \quad \nabla \cdot \mathbf{A} = 0 \qquad \text{(Coulomb gauge)}$$
$$\nabla \times \mathbf{B} = \mu_0 \mathbf{J} \quad \Leftrightarrow \quad \nabla \times \mathbf{A} = \mathbf{B}$$

Sketch **B** in Fig 1 (note this is a "cylindrical" volume with uniform **J**). Then, using the mathematical similarities above, sketch **A** in Fig 2:

Side view:

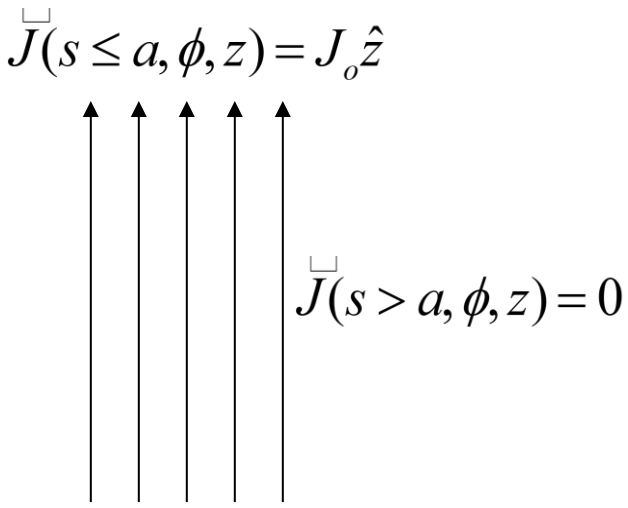


Figure 1: Given **J**, sketch the **B** field.

Side view:

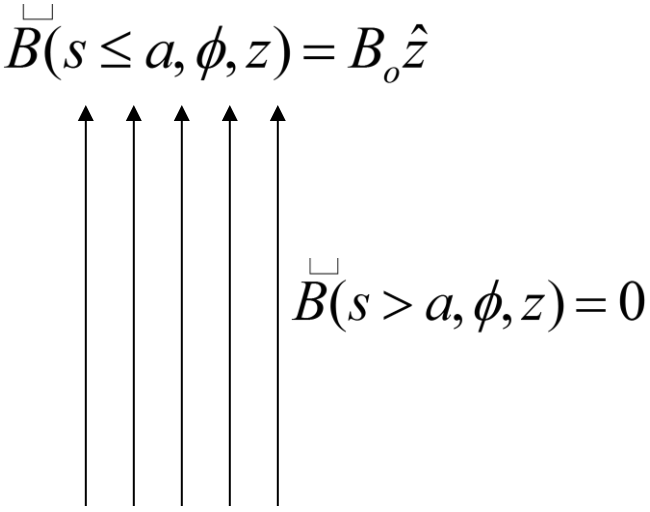
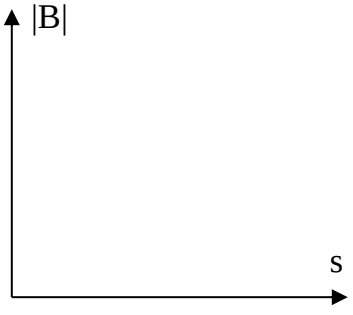


Figure 2: Given **B**, sketch the **A** field.



What physical situation is this?

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Turn over ….

One way to check your previous answer (conceptually) is using an Ampere's Law analogy.

Ampere's Law tells you that the **J**-flux (or I_{encl}) is equal to $\oint \vec{B} \bullet d\vec{l}$.

What is a similar relationship between the vector potential and magnetic field?

Try using this "Ampere's Law analogy" to check your sketch of **A**.